

**Discharge Process of Li/polymer Electrolyte/S Cell
at Room Temperature**

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Introduction

The lithium/sulfur cell was an extremely attractive redox couple because of high theoretical specific energy of 2600Wh/kg(1672mAh/g-sulfur), assuming complete reaction to the Li_2S . However, it has been very difficult to make a good Li/S cell because of high resistivity and reactivity of sulfur [1,2]. Recently, Cairn’s group [3] investigated on the Li/polymer electrolyte/S cell using composite sulfur cathode with carbon and polymer. The discharge capacity of sulfur electrode depended on the operating temperature. The utilization of sulfur cathode at 90 °C was over 85%. However, the discharge capacity at room temperature was 752mAh/g-sulfur (45% utilization). There was no study on the discharge mechanism of the Li/polymer/S cell. In this study, we investigated on the discharge process of Li/S cell at room temperature (25 °C), and also improved the utilization of sulfur cathode.

Experimental

Sulfur electrodes were prepared by glass casting using sulfur, carbon black, PEO, LiCF_3SO_3 powders. The PVdF-HFP (Kynar 2801) film was used as electrolyte. The components were dried at 50 °C in a vacuum atmosphere, and then Li/S cell was assembled in argon atmosphere. In order to investigate on the discharge process, the discharge products were tested by X-ray diffractometer(XRD), Differential Scanning Calorimeter(DSC), Scanning Electron Microscope(SEM), and Energy Dispersive Spectrometer (EDS).

Results and discussion

The Discharge curve of Li/PVDF-HFP/S cell was shown in Fig. 1. The capacity was 1364mAh/g-sulfur, which was higher than previous results. Chu[4] reported the 900mAh/g-S using Li/PVDF-HFP/S cell at 30 °C, and Cairns obtained 752mAh/g-S at 23 °C with a PEGDME-based electrolyte. The curve had two plateaus, which might be related with two different electrochemical reactions between sulfur and lithium.

Reference

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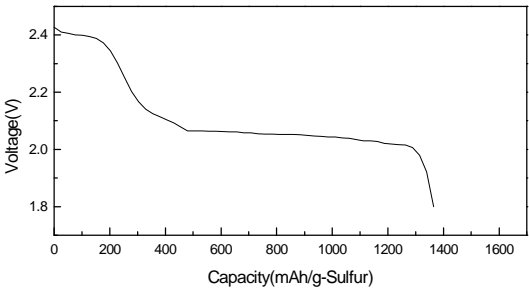


Fig. 1. Discharge curve of Li/polymer electrolyte/S